REMARKS

Reconsideration by the Examiner is respectfully requested in light of the above amendments, the remarks which follow, and the accompanying Declaration.

The present invention provides dramatic improvements in the ability to produce bonded nonwoven webs from melt extruded thermoplastic fibers or filaments. In particular, it addresses the problem of bonding fibers or filaments containing lower melting polymer materials that melt below about 140°C. Nonwoven webs made from fibers or filaments containing these lower melting polymer materials are in demand because the nonwoven webs have excellent softness properties and can be used in products that come into contact with sensitive skin, such as disposable diapers, for example. However, it has been difficult to manufacture nonwoven webs containing these materials because there is a relatively narrow "window" of temperature, time and pressure conditions where acceptable bonding occurs. At the high speeds required for commercial production of nonwovens, it is extremely difficult to maintain the calender conditions within the narrow zone required for acceptable bonding. Under bonding results in a web with poor abrasion resistance and poor strength properties. Over bonding can also result in poor strength properties, as well as an undesirable loss of softness.

In accordance with the present invention, it has been discovered that unexpected improvements in nonwoven fabric physical properties, such as tensile strength, abrasion resistance and softness, can be achieved by bonding the nonwoven web with a patterned embossing roll having an outer surface including a multiplicity of individual raised calender lands which are spaced apart from one another by intervening depressions, wherein at least these depressions are covered by surface coating of a fluoropolymer.

Claims 1-7, 9-15 and 18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Matsuoka et al., U.S. Patent No. 5,795,651 in view of McHale, WO 90/13423. The Matsuoka patent is concerned with the manufacture of a nonwoven fabric made from flash spun plexifilamentary strands. This kind of nonwoven fabric is disclosed to be useful for various purposes including making envelopes, packing materials, floppy disk sleeves, waterproof materials, labels, thermal insulation materials, synthetic paper, house wrap, and the like. This kind of nonwoven fabric is similar to the familiar Tyvek material sold by DuPont and used for envelopes, house wrap and the like.

In contrast, the present invention is concerned with the manufacture of nonwoven fabrics made from the more conventional type of melt extruded thermoplastic fibers or filaments. Molten polymer is extruded through fine capillaries in a spinneret to form fibers or filaments that are attenuated or drawn and then formed into a nonwoven fabric. This kind of nonwoven fabric has fundamentally physical and tactile properties as compared to the type of fabric described by Matsuoka. Flash-spun fabrics of the type described by Matsuoka are characteristically relatively stiff and have a harsh tactile property (hand), whereas the melt-extruded fabrics of the present invention must be very soft and flexible. The fabrics find utility in entirely different kinds of products. To more clearly differentiate applicant's process from that of the Matsuoka reference, the claims have been amended to recite forming a nonwoven web formed of "melt extruded" thermoplastic fibers or filaments.

The Matsuoka reference mentions that the web of plexifilamentary strands can be bonded with heat and pressure by a group of rolls (*see* Col. 9, lines 1-36) and mentions that when steel rolls are used, they can be coated with a fluoroethylene resin or with rubber. However, it is evident that this disclosure refers to smooth calender rolls. There is no suggestion or teaching of a fluorochemical coating on an embossing roll. The patent later refers to an embossing roll (*see* Cols. 11 and 12) but there is no disclosure or suggestion of applying a fluoropolymer coating to such rolls. It is evident that the Matsuoka reference does not address the problem which is addressed by Applicant's invention.

The McHale reference describes providing coatings on rolls used for embossing a web of flash spun polyethylene plexifilamentary strands, and discloses polytetrafluoroethylene as one such coating. However, the apparent purpose of the coating is to prevent sticking of the plexifilamentary strands to the roll. Thus, the McHale reference, like Matsuoka, is concerned with bonding a different kind of nonwoven fabric. The McHale reference also fails to approach the problem that is addressed by Applicant's invention and there is certainly no teaching or suggestion that the use of a coated roll in bonding a nonwoven web made of melt extruded thermoplastic fibers or filaments would produce a fabric with improved physical properties.

Claims 1-20 have also been rejected under 35 U.S.C. § 103(b) over the Van Gompel reference (U.S. Patent No. 4,725,473) in view of McHale. The Examiner contends that it would

have been obvious to include a fluoropolymer coating as suggested by McHale on the embossing roll of Van Gompel.

The Van Gompel patent discloses a method for making a liquid impervious composite material including a fibrous layer and a liquid impervious film layer. Loose fibers are deposited onto the liquid impervious film and then the two layers are point bonded. The point bonding is achieved by passing the layers into contact with a patterned embossing roll. As recognized by the Examiner, there is no disclosure or suggestion of the embossing roll being coated with a fluoropolymer coating. This patent is not concerned with point bonding of a nonwoven fabric by itself, and there is certainly no teaching or suggestion providing a motivation to modify the embossing roll of Van Gompel by applying a fluoropolymer coating. Clearly, the Van Gompel patent, whether considered singly or in combination with McHale, does not teach or make obvious Applicant's unexpected discovery that the process defined in Claims 1-20 produces a nonwoven fabric of unexpectedly improved properties.

Accompanying this response is a Declaration under 37 CFR 1.132 which presents data comparing the results obtained in bonding a nonwoven web in accordance with the invention, versus bonding the same web with a conventional uncoated roll. As seen from the graph, the use of a coated roll produces a nonwoven fabric having significantly greater tensile strength as compared to a non-coated roll, when bonding at the same temperature. The prior art does not teach or suggest this phenomenon. As can also be seen from the graph, the use of the coated roll makes it possible to achieve high quality nonwoven fabric with acceptable tensile strength over a much broader range of bonding temperatures than can be achieved using an uncoated roll.

The data from the commercial trials reveal that the fabrics produced in accordance with the invention not only have increased tensile strength, but also increased abrasion resistance without loss of softness. This is a further unique and unexpected result of the process of the present invention.

These results are not taught or suggested in the prior art and are truly unexpected. This further demonstrates the nonobviousness of the present invention.

Accordingly, favorable reconsideration by the Examiner, withdrawal of the rejections, and formal notification of the allowability of Claims 1-20 as now presented are earnestly solicited.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450, on February 2, 2004.

Janet F. Sherrill

Attorney's Docket No. 034423/207670 PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re:	Farell et al.	Confirmation No.:	1053
Appl. No.:	09/943,789	Group Art Unit:	1733
Filed:	August 31, 2001	Examiner:	Todd J. Kilkenny
For:	METHOD OF MAKING A BONDED NONWOVEN WEB		

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 C.F.R. § 1.132

I, Jay Darrell Gillespie do hereby declare and say as follows:

1. I am employed by BBA Nonwovens Simpsonville, Inc. as Manager, Pilot Operations and I am a named inventor in the above-referenced patent application.

2. In connection with the development of the present invention, I conducted experiments on BBA's 22 inch lab calender to compare the results obtained using a conventional uncoated steel engraved calender roll and a similar calender roll that had been plasma coated with a fluoropolymer composition. The calender rolls had 144 pins per square inch and approximately 16% bond area. Nonwoven fabric samples were prepared from bicomponent fibers having a 50/50 polypropylene core and a polyethylene sheath. The nonwoven fabrics were calendered at various temperatures and the resulting bonded nonwoven fabrics were tested to measure the peak tensile strength in the machine direction (MD) and in the cross direction (CD). The results are shown in the graph below.

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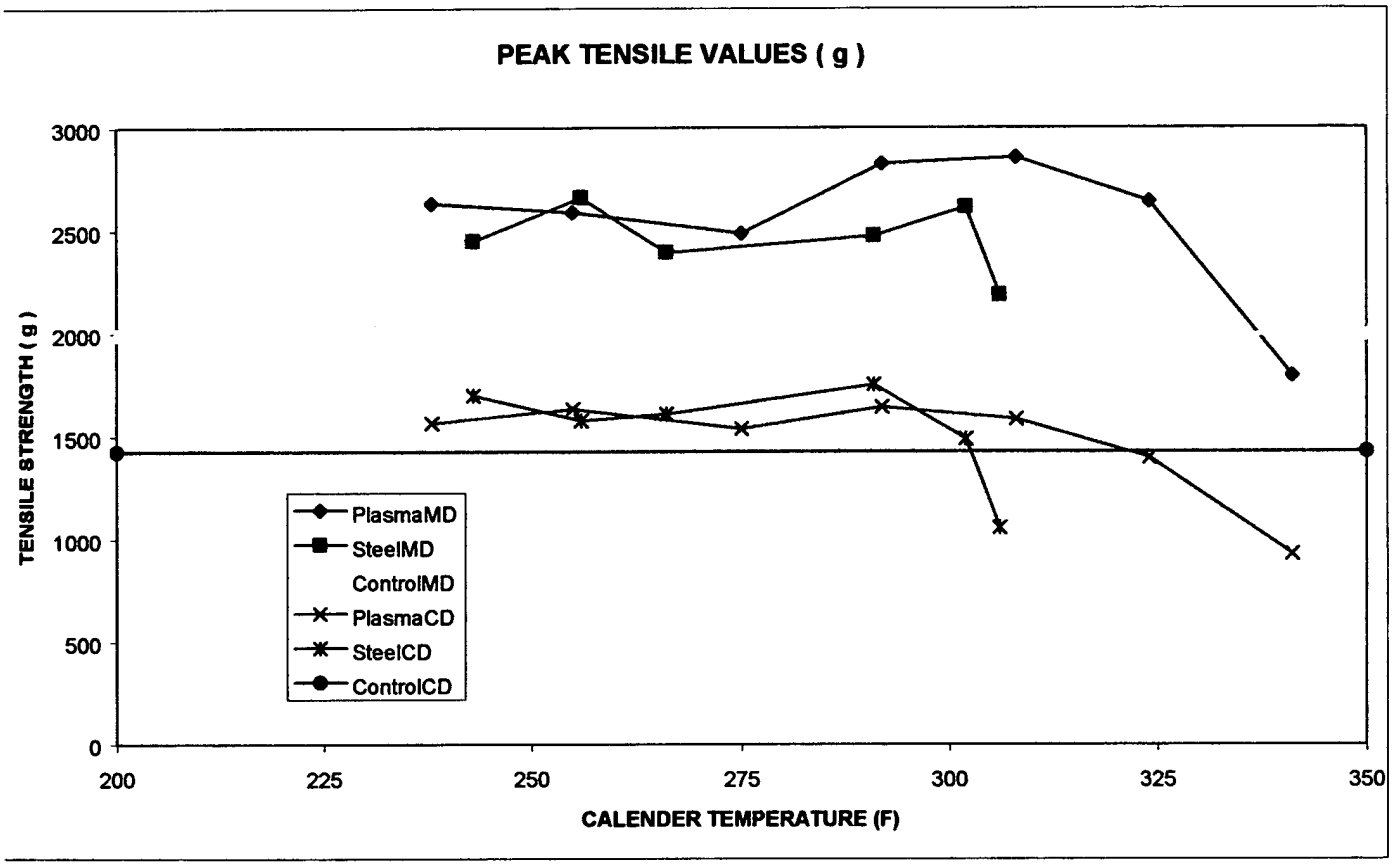

3. As seen from this graph, with the uncoated steel roll the webs could be bonded over a temperature range of approximately 240°F to 280°F. At temperatures above about 290°F, the web tensile strength dropped off significantly, and the calendering operation could not be carried out at temperatures above 305°. However, with the coated roll, the temperature at which bonding could be successfully carried out was extended at least 35°F. Bonding could be carried out at temperatures as high as 325°F before significant loss of tensile strength occurred, and the calendering was carried out without the filaments sticking to the calender roll. This demonstrated to us that the coated roll would be most advantageous in a commercial operation where it is often difficult to control the bonding conditions to narrow temperature tolerances. From this experiment, we also observed, to our surprise, that an increase in tensile strength was achieved as compared to bonding under the same conditions with an uncoated steel roll. This increase is readily evident from the above graph. While it might be expected that the use of a fluoropolymer-coated roll would reduce problems with sticking, it is not at all self-evident or

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obvious that the use of a coated roll would actually improve the physical tensile properties of the nonwoven fabric.

4. A commercial scale trial was subsequently conducted at our Washougal, Washington spunbond manufacturing facility using a 144 pins per square inch engraved calender roll with 17% bond area that had been plasma coated with a fluoropolymer coating. The nonwoven fabric produced on this line was a spunbond nonwoven fabric of approximately 20 gsm basis weight, with the filaments being formed of sheath-core bicomponent filaments having a polyethylene sheath and a polypropylene core (50/50 PP/PE). The table below compares the tensile strength, the abrasion resistance, and the softness of samples bonded at varying temperature conditions ranging from 265°F to about 300°F.

	Smooth Roll (°F)	Engraved Roll (°F)	Ink Rub	MD tensile	CD tensile	Softness Rating
Reference Example	265	265	0.266	1216	1079	2.1
Example 1	285	285	0.180	1632	1276	2.2
Example 2	300	290	0.163	1035	802	2.2

5. As seen from the above table, the tensile strength was dramatically increased by a 20°F increase in the operating temperature of the coated calender roll – a CD increase of 34% and 18% in the MD. The bonding operation ran smoothly on the commercial production line with no breaks or filaments wraps on the calender roll. Our normal operating conditions on this calender with our old uncoated steel roll was 265°F. It would not have been possible to run our old uncoated roll at 285°F for long periods of time due to calender wraps.

6. The abrasion resistance of the nonwoven fabric was measured using a modified version of the Sutherland ink rub test (ASTM D-5264). The MD and CD tensile strength was measured using standard ASTM test method D-1682. The softness of the fabric was evaluated subjectively on a scale of 0 to 4, where 4 is softest.

7. These data also show that the abrasion resistance of the fabric is increased markedly by the use of the coated roll at the higher bonding temperature. Furthermore, this increase in abrasion resistance was achieved without an objectionable loss in the softness of the fabric, as is evident from the softness rating. Softness is a vital characteristic in nonwoven fabrics intended to come into contact with sensitive skin, such as in disposable diapers. The

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difference between an ink rub of 0.266 and 0.180 is very significant, and can make the difference as to whether the nonwoven fabric is suitable for use as a diaper back sheet.

8. The ability to increase both the tensile strength and the abrasion resistance of a nonwoven fabric without compromising softness through the use of a coated calender roll was not obvious to me at the outset of this project and I believe that it represents a truly unexpected result.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Jay D. Gillespie

Jay Darrell Gillespie

1-27-04

Date